Yangon University of Economics
Post Graduate Diploma in Research Studies (PGDRS) Progamme
First Quarter Examination, September 2023

PGDRS-113
PGDRS (9th Batch) **Probability Theory**
Answer **All** Questions. **Time Allowed: 3 hours**

1. Studies show that about one woman in seven (approximately 14.3%) who live to be 90 will develop breast cancer. Suppose that of those women who develop breast cancer, a test is negative 2% of the time. Suppose that in the general population of women, the test for breast cancer is negative about 85% of the time. Suppose one woman is selected at random.

   (a)What is the probability that the woman develops breast cancer? What is the probability that woman tests negative?

   (b) Given that the woman has breast cancer, what is the probability that she tests negative?

   (c) What is the probability that the woman has breast cancer and tests negative?

   (d) What is the probability that the woman has breast cancer or tests negative?

   (e) Are having breast cancer and testing negative independent events?

   (f) Are having breast cancer and testing negative mutually exclusive?

2. (a) The Pizza Palace offers three sizes of cola—small, medium, and large—to go with its pizza. The colas are sold for 750 kyats, 850 kyats, and 1000 kyats, respectively. Thirty percent of the orders are for small, 50 percent are for medium, and 20 percent are for the large sizes. Organize the size of the colas and the probability of a sale into a probability distribution. Compute the mean amount charged for a cola. What is the variance in the amount charged for a cola and the standard deviation?

   (b) The probability that a person will make 0, 1, 2, or 3 errors on his or her income tax return is 0.50, 0.30, 0.15, and 0.05, respectively. If 30 claims are selected, find the probability that 15 will contain 0 errors, 8 will contain 1 error, 5 will contain 2 errors, and 2 will contain 3 errors.

3. There are fourth-five flowers for sale at a small shop. Twenty flowers are Rose and remaining are Lily flowers. If the customer selects ten flowers, find the probability that

   (a) all ten are Lily (b) none of them are Lily and (c) no more than six are Lily.

4.(a) A manufacturer of window frames knows from long experience that 5% of the production will have some type of minor defect that will require an adjustment. What is the probability that in a sample of 20 window frames:

   (i) None will need adjustment? (ii) At least one will need adjustment? (iii) More than two will need adjustment?

   (b) In a batch of 2000 calculators, there are, on average, 8 defective ones. If a random sample of 150 is selected, find the probability of 5 defective ones.

5.(a) The average number of milligrams (mg) of sodium in a certain brand of low-salt microwave frozen dinners is 660 mg, and the standard deviation is 35 mg. Assume the variable is normally distributed.

(i) If a single dinner is selected, find the probability that the sodium content will be more than 670 mg.

(ii) If a sample of 10 dinners is selected, find the probability that the mean of the sample will be larger than 670 mg.

(b) The average per capita spending on health care in the United States is \$5274. If the standard deviation is \$600 and the distribution of health care spending is approximately normal, find the limits of the middle 50% of individual health care expenditures.